United States
Environmental Protection Agency

Air and Radiation
6202J

Draft
November 1998

EPA Coalbed Methane Outreach Program Technical Options Series

USING COAL MINE METHANE FOR HEATING MINE FACILITIES

The National Coal Museum in Illinois recovers methane from an abandoned coal mine to heat buildings

BENEFITS OF USING COAL MINE METHANE FOR SPACE AND WATER HEATING AT COAL MINES...

- Reduces costs by displacing other fuels that are used for heating
- Uses a fuel that is readily available at gassy coal mines
- Reduces emissions of methane, a greenhouse gas, to the atmosphere
- A profitable methane use option for mines with degasification systems in place

Use of coal mine methane on-site at gassy mines for space heating and/or water heating is potentially profitable

Why Consider Using Coal Mine Methane to Heat Mine Facilities?

Many gassy coal mines drain methane from their coal seams for safety reasons. While some mines recover and sell this methane, many mines simply vent it to the atmosphere unused. One potentially profitable option is to recover the methane and use it on-site to heat buildings and/or hot water. Most mines in the United States currently heat their surface facilities with natural gas, fuel oil (diesel), or propane. In some countries, it is common for coal mines to heat their facilities using coal-fired boilers. Coal mine methane may be a profitable alternative to other fuels, because it eliminates the cost of purchased fuel, or, in the case of coal-fired boilers, frees up coal for sale. Coal mine methane use is also beneficial to the environment, in that it reduces emissions of methane, a greenhouse gas, to the atmosphere.

The use of coal mine methane for this purpose is not new. Gassy coal mines in several countries (including China, the Czech Republic, Poland and Ukraine) use a portion of the methane they drain on-site for space and/or hot water heating. In such cases, the coal mine methane often replaces low-quality coal, and provides an economical, clean-burning alternative. The National Coal Museum in West Frankfort, Illinois recovers methane from the abandoned Orient No. 6 mine to heat restored mine buildings that are now used by a community college.

CMOP can provide the necessary technical and financial modeling support to coal companies interested in a site-specific analysis

Gassy coal mines that currently drain methane and wish to recover it for space and hot water heating would need to modify their heating systems. The most significant costs associated with these modifications will typically be the purchase of a compressor (to compress the gas for transportation from its production location to the building(s) to be heated) and installation of a pipeline. A mine that is already using natural gas, propane, or fuel oil to heat its buildings will also require minor modifications to the system. A mine that currently uses electricity or burns coal in a boiler would require more extensive modifications.

EPA Financial Analysis

EPA's Coalbed Methane Outreach Program (CMOP) prepared an analysis to illustrate the financial viability of using coal mine methane for heating surface facilities and hot water at active underground gassy coal mines. The analysis of any coal mine recovery project requires estimates of methane flow and availability at the mine. This case study builds on the following information:

Gas Availability and Use

Use of coal mine methane reduces emissions of this greenhouse gas to the atmosphere

For this illustration, the study assumes that the mine:

- produces an average of 4 million tons of coal each year;
- liberates 550 cubic feet of methane per ton of coal mined;
- currently uses propane, natural gas or fuel oil to heat its buildings;
- wishes to satisfy a heating demand of 10,000 million BTUs of fuel annually; and,
- can produce enough methane from an existing gob well to meet this demand (a least 11 million cubic feet per year)

Costs[1]

The study assumes that project costs are as follows:

- capital costs (skid mounted compressor, 1 mile of installed pipeline, engineering design, hot water system modifications) - $55,000
- estimated annual operating cost is $8,000

Financial Assumptions

[1]These are standard cost assumptions used in most first-order CMOP financial analyses of heating with coal mine methane

The analysis makes the following financial assumptions:

- the project will have a 20-year life;
- annual inflation rate is 4%;
- the real discount rate is 6%;
- the tax rate is 27.5%; and
- 100% equity project financing.

Results of the Analysis

Incremental benefits of this project are the annual savings realized from using recovered methane instead of purchasing fuel. The analysis computes incremental benefits based on a range of costs for purchased fuels. The following table lists the results of the analysis, showing that the project would be economically viable even when the cost of purchased fuel is unusually low.

Using Coal Mine Methane for Heating Mine Buildings and Hot Water

Scenario	Cost of Purchased Fuel* ($mmBtu)	Capital Cost ('$000)	Annual Cost ('$000)	NPV ('$000)	IRR (%)	Payback Years
1	$ 3.00	$ 55	$ 8	$ 134	35%	4
2	$ 5.00	$ 55	$ 8	$ 301	63%	2
3	$ 8.50	$ 55	$ 8	$ 592	111%	1

*To put these purchased fuel costs in perspective, following are typical purchase prices for various fuels, in $US per mmBtu: Natural gas - $4.75–5.75; Fuel Oil (Diesel) - $4.00-$5.00; Propane - $6.50-8.50; Electricity - $13.00-14.50.

The results of this analysis suggest that use of coal mine methane on-site for heating mine buildings and hot water at a gassy underground coal mine is a potentially profitable project option. To refine this analysis would require additional inputs such as actual gas content data, methane emissions data, and the cost of displaced fuel. CMOP can provide the necessary technical and financial modeling support to coal companies interested in a site-specific analysis.

Contact EPA's Coalbed Methane Outreach Program for information about this and other profitable uses for coal mine methane:

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